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| APPLICATION NO.  | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.    | CONFIRMATION NO. |
|--|-------------|----------------------|------------------------|------------------|
| 10/651,048   | 08/29/2003  | Pradeep K. Govil     | 1857.2010000           | 8531             |
| 26111 7590 01/30/2007<br>STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.<br>1100 NEW YORK AVENUE, N.W.<br>WASHINGTON, DC 20005 |             |                      | EXAMINER<br>DINH, JACK |                  |
|  |             |                      | ART UNIT<br>2873       | PAPER NUMBER     |

| SHORTENED STATUTORY PERIOD OF RESPONSE | MAIL DATE  | DELIVERY MODE |
|--|------------|---------------|
| 3 MONTHS                               | 01/30/2007 | PAPER         |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

|                              |                 |              |  |
|------------------------------|-----------------|--------------|--|
| <b>Office Action Summary</b> | Application No. | Applicant(s) |  |
|                              | 10/651,048      | GOVIL ET AL. |  |
|                              | Examiner        | Art Unit     |  |
|                              | Jack Dinh       | 2873         |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 26 October 2006.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 37-55 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 37-55 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |  |
|--|--|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)                |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____   |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application      |
| Paper No(s)/Mail Date _____  | 6) <input checked="" type="checkbox"/> Other: <u>DETAILED ACTION</u> . |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election without traverse in the reply filed on 10/26/06 is acknowledged.

However, upon reconsideration, the previous restriction requirement is withdrawn. Claims 37-55 are pending.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 48 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 48, "the material" lacks antecedent basis.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claim 37, 47, 49, 54 and 55 are rejected under 35 U.S.C. 102(b) as being unpatentable by Takeuchi et al. (US Patent 6,249,370).

Regarding claim 37, Takeuchi (figures 24 and 9) is interpreted as disclosing a spatial light modulator configured to receive an incident wavefront, comprising a continuous solid and substantially rigid substrate **22** having a surface, and a plurality of individual actuators **14** formed on the surface of the substrate and separated laterally from one another thereby forming a two dimensional array, each of the individual actuators having a mirror **102** formed on an actuator element section, the actuator element section including an actuator element **32** (figure 9) that is sandwiched by a pair of electrodes **34a** and **34b**, wherein for each of the individual actuators, the mirror is formed so that when the electrode pair is energized the individual actuator moves the mirror with respect to the surface of the substrate, such that the incident wavefront is modulated to produce an output wavefront (see figures).

Regarding claim 47, Takeuchi (figure 24) is interpreted as further disclosing wherein that pairs of electrodes cause a material of the individual actuators to expand and contract in a piston-like motion to move the mirrors along a longitudinal axis of the individual actuators, wherein during the piston-like motion a reflecting surface of the mirror remains parallel to a plane formed through the surface of the substrate to modulate the incident wavefront.

Regarding claim 49, Takeuchi (figure 24) is interpreted as further disclosing wherein the mirrors modulate respective positions of the incident wavefront through actuation with respect to each other, which causes at least one of a phase shift or interference pattern in an output wavefront.

Regarding claim 54, Takeuchi (figures 24 and 9) is interpreted as disclosing a method of forming a spatial light modulator that receives an incident wavefront and modulates the incident wavefront, comprising forming a plurality of individual actuators **14** including actuation element sections on a surface of a continuous solid and substantially rigid substrate **22**, the plurality of individual actuators being separated laterally from one another thereby forming a two dimensional array, forming electrodes **34a** and **34b** at opposite ends of each respective actuator element **32** (figure 9) in each respective one of the actuator element sections, and forming a mirror **102** on each of the individual actuator sections, wherein, for each of the individual actuators, the mirror is formed so that when the electrode pair is energized the individual actuator moves the mirror with respect to the surface of the substrate, such that the incident wavefront is modulated to produce an output wavefront.

Regarding claim 55, Takeuchi (figures 24 and 9) is interpreted as disclosing a method, comprising receiving an incident wavefront on a two dimensional array of mirrors **102**, and moving respective ones of the mirrors through energizing of electrode pairs **34a** and **34b** formed at opposite ends of corresponding actuator elements **32** (figure 9) in corresponding ones of actuator element sections of corresponding ones of a plurality of individual actuators formed on a surface of a continuous solid and substantially rigid substrate **22** and separated laterally from one another, thereby forming a two dimensional array of the individual actuators, each of the actuator element sections is coupled to a corresponding one of the mirrors, wherein when selected ones of the electrode pairs are energized respective ones of the individual actuators move respective ones

Art Unit: 2873

of the mirrors with respect to the surface of the substrate, such that the incident wavefront is modulated to produce an output wavefront.

*Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 38-41, 43-46, 50 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeuchi et al. (US Patent 6,249,370), as applied in claim 37, in view of Makino et al. (US Patent 6,549,694).

Regarding claims 38 and 39, Takeuchi is interpreted as disclosing all the limitations, as described above, except that the actuator elements and electrodes are configured to move the reflective elements in two and four directions. Within the same field of endeavor, Makino is interpreted as disclosing that reflective elements move in two and four directions are well known, such as tilting (left and right) as shown in figure 5 or moving vertically (up and down) as shown in figures 6A and 6B. Therefore, it would have been obvious to one having ordinary skill in the art at the time that the invention was made to provide reflective elements move in two or four directions, as taught by Makino, for the purpose of increasing the reflective elements' functionality.

Regarding claims 40 and 41, Makino (figure 5) is interpreted as further disclosing that each of the second array of electrodes comprises first and second electrode sections **107a** and **107b** configured to allow the actuator elements to tilt the reflective devices.

Regarding claim 43, Makino (figure 6B) is interpreted as further disclosing that adjacent ones of the actuator elements have different heights (see figure).

Regarding claims 44, Makino (figure 5) is interpreted as further disclosing that the actuator elements moves the reflecting device about one-quarter of a wavelength of light in each direction (col. 2, lines 47-54).

Regarding claims 45, 50 and 51, Takeuchi is interpreted as disclosing all the limitations, as described above, except that the actuator elements are controlled with respect to each other to form a particular overall shape. Within the same field of endeavor, Makino (figures 6A and 6B) is interpreted as disclosing that the actuator elements are controlled with respect to each other to form a desired reflecting configuration. Therefore, it would have been obvious to one having ordinary skill in the art at the time that the invention was made to control the actuator elements, as taught by Makino, for the purpose of forming a desired reflecting configuration.

Regarding claim 46, Makino et al. (figure 5) is interpreted as further that the actuator elements **108** are formed in varying heights and positions on the substrate, such that varying wavefront patterns are generated by light reflecting therefrom.

5. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takeuchi et al. (US Patent 6,249,370), as applied in claim 37, in view of Amm et al. (US Patent 6,639,722).

Regarding claim 42, Takeuchi et al. is interpreted as disclosing all the limitations, as described above, except for a first coupling device and a second coupling device. Within the same field of endeavor, Amm et al. (figure 3A and 3B) is interpreted as disclosing a teaching of a configuration wherein the actuator elements can be controlled in groups. Although the drawing does not explicitly shows the coupling features, the teaching would strongly suggest that such coupling features would have been obvious modifications to one of ordinary skill from the spatial light modulator of Takeuchi et al. Therefore, it would have been obvious to one having ordinary skill in the art at the time that the invention was made to a first and a second coupling device, as suggested by Amm et al., for the purpose of controlling the adjacent actuator elements in groups.

6. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takeuchi et al. (US Patent 6,249,370), as applied in claim 37, in view of Fujita (US Patent 6,002,154).

Regarding claim 52, Takeuchi discloses all the limitations as described above, except for an insulating layer coupled to the substrate that dissipates heat from the respective electrodes in the second set of electrodes. Within the same field of endeavor, Fujita is interpreted as disclosing such teaching (col. 1, lines 55-65). Therefore, it would have been obvious to one having ordinary skill in the art at the time that the invention was made to provide an insulating layer for the purpose of dissipating heat from the electrodes to avoid overheating the device.



7. Claim 53 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takeuchi et al. (US Patent 6,249,370), as applied in claim 37.

Regarding claim 53, Takeuchi (figure 24) is interpreted as further disclosing wherein that pairs of electrodes cause a material of the individual actuators to expand and contract in a piston-like motion to move the mirrors along a longitudinal axis of the individual actuators, wherein during the piston-like motion a reflecting surface of the mirror remains parallel to a plane formed through the surface of the substrate to modulate the incident wavefront. Takeuchi discloses all the claimed limitations except that the mirror surface becomes unparallel to the substrate. Takeuchi (figure 26) discloses an embodiment wherein the mirror surface becomes unparallel to the substrate. Therefore, it would have been obvious to one having ordinary skill in the art at the time that the invention was made to control the mirror surface unparallel to the substrate for the purpose of forming a desired reflecting configuration.

#### ***Response to Arguments***

8. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

#### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jack Dinh whose telephone number is 571-272-2327. The examiner can normally be reached on M-F (9:30 AM - 6:00 PM).

Art Unit: 2873

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ricky L. Mack, can be reached at 571-272-2333. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Jack Dinh  
01/18/07

  
RICKY MACK  
SUPERVISORY PATENT EXAMINER